

Date: Mon, 10 Oct 94 04:30:19 PDT  
From: Ham-Digital Mailing List and Newsgroup <ham-digital@ucsd.edu>  
Errors-To: Ham-Digital-Errors@UCSD.Edu  
Reply-To: Ham-Digital@UCSD.Edu  
Precedence: List  
Subject: Ham-Digital Digest V94 #335  
To: Ham-Digital

Ham-Digital Digest                      Mon, 10 Oct 94                      Volume 94 : Issue    335

Today's Topics:

          continuous data transfer over +/- 2 miles  
          FAX Software for KAM/KAM Plus?  
          WANT: Computer Aided Dispatch system

Send Replies or notes for publication to: <Ham-Digital@UCSD.Edu>  
Send subscription requests to: <Ham-Digital-REQUEST@UCSD.Edu>  
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Ham-Digital Digest are available  
(by FTP only) from UCSD.Edu in directory "mailarchives/ham-digital".

We trust that readers are intelligent enough to realize that all text  
herein consists of personal comments and does not represent the official  
policies or positions of any party. Your mileage may vary. So there.  
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Date: Sat, 8 Oct 1994 14:05:56 GMT  
From: gary@ke4zv.atl.ga.us (Gary Coffman)  
Subject: continuous data transfer over +/- 2 miles

In article <stephenh.34.002C746A@autonomous.com> stephenh@autonomous.com (Steve  
Hochschild) writes:

>I need to send a continuous data stream at about 1200 baud over a distance of  
>about 2 miles.

>

>I am trying to instrument an amateur race car and send real time telemetry  
>back to the pits. I am a total novice on this, but someone told me packet  
>radio would be a way to go. After reading the FAQ, I don't think that this is  
>so, rather, I think I need some other form of digital transmission...  
>Any ideas ???

Packet may not be best for pure telemetry. It will give you an error  
free data stream by error detection and retries, but you'd have to run  
at least 9600 baud packet to get 1200 bps raw throughput, and really  
need a transceiver on each end. If instead you can tolerate the occasional  
transmission error, or use FEC, then what you want is a simple half-duplex

modem over radio. The most ancient of these, the Bell 202 Standard type, will give you a raw 1200 bps throughput. A PSK modem would be more robust, however. The ones used to decode amateur satellite telemetry would do.

Telco modems generally can't be used because of their internal "smarts" which insist on attempting to setup a duplex link, and dropping it if carrier is momentarily lost. Only the ancient dumb modems meant for leased lines can generally be used.

Gary

--

Gary Coffman KE4ZV		You make it,		gatech!wa4mei!ke4zv!gary
Destructive Testing Systems		we break it.		emory!kd4nc!ke4zv!gary
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Date: Sun, 9 Oct 94 14:33:30 -0500  
From: Kevin Charles Alewine <kcalewine@delphi.com>  
Subject: FAX Software for KAM/KAM Plus?

Anyone had any luck finding a good FAX send/receive program for the KAM? Freeware, shareware, or commercial, any suggestions would be appreciated!

Thanks!

--

K.C. Alewine, South Lake Tahoe, California		Air Traffic Controller
Internet: kcalewine@delphi.com		Lake Tahoe ATCT
Ham packet radio: WI7C@WA6EWV.#NOCAL.CA.USA		Ham Call WI7C

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Date: Sun, 09 Oct 94 09:50:32 EDT  
From: pp000814@interramp.com  
Subject: WANT: Computer Aided Dispatch system

I would like to know what info turns up here. Several people who work for me will be attending a meeting at the Dulles Marriott this week to discuss 911 service for PCS and Cellular users.

In article <CxBn4C.7yB@peacock.tcinc.com>, <sjames@tcinc.com> writes:  
> Newsgroups: rec.radio.amateur.digital.misc

> Path:  
interramp.com!psinnntp!rutgers!netnews.upenn.edu!msuinfo!caen!spool.mu.edu!sol.c  
tr.columbia.edu!news.msfc.nasa.gov!news.larc.nasa.gov!lerc.nasa.gov!purdue!yuma  
!csn!nowhere!aitsun20!sjames  
> From: sjames@tcinc.com (Scott James)  
> Subject: WANT: Computer Aided Dispatch system  
> Message-ID: <CxBn4C.7yB@peacock.tcinc.com>  
> Sender: news@peacock.tcinc.com (Internet News Administration)  
> Nntp-Posting-Host: aitsun20  
> Organization: TeleCommunications, Inc.  
> X-Newsreader: TIN [version 1.2 PL2]  
> Date: Fri, 7 Oct 1994 21:16:59 GMT  
> Lines: 14  
>  
>  
> I'm looking for a Computer Aided Dispatch (CAD) system  
> that links radio modem technology with a GIS display.  
> These systems are used by Federal Express (I think)  
> and 911 agencies.  
>  
> If you know of any products or companies that can help  
> me find such a system, please email me with the info.  
>  
> thanks in advance!  
>  
> scott james  
> NOLHX  
>

-----  
Date: Sat, 8 Oct 1994 13:23:18 GMT  
From: gary@ke4zv.atl.ga.us (Gary Coffman)

References<9410040039.AA02497@enterprise.chinalake.navy.mil>  
<19940ct4.141109.27381@ke4zv.atl.ga.us>, <374q1p\$n6h@u.cc.utah.edu>  
Reply-To: gary@ke4zv.atl.ga.us (Gary Coffman)  
Subject: Re: 56k+ Packet System

In article <374q1p\$n6h@u.cc.utah.edu> val@cs.weber.edu (Val Kartchner) writes:  
>In article <19940ct4.141109.27381@ke4zv.atl.ga.us>,  
>Gary Coffman <gary@ke4zv.atl.ga.us> wrote:  
>>Well then you need a GRAPES 56kb RF modem. It's \$250, and with the  
>>necessary transverter and digital interface, it's still under \$600.  
>>Most of the voice radios being used for 1200 baud packet cost nearly  
>>that much. 46 times the throughput for about the same money is an  
>>unbeatable deal.  
>

>But what specific components do you need and where do you get them? I've  
>got a catalog from Down East Microwave, and I don't know what transverter  
>to put with the GRAPES modem. I need enough power output to reliably get  
>the signal to go 8 miles.

Their no tune 432 transverter may be sufficient by itself for such a path, assuming LOS and directional antennas. Or you can add the amplifier they offer. They offer the whole package assembled and tested, or as separate kits. We typically operate 3-7 watt systems over 50-100 mile paths. Those paths are mountaintop to mountaintop, but using omni vertical antennas on at least one end of the path. For non-LOS use, more power, or a gain antenna, may be required. We have one user who's running 100mW and a 1/4-wave vertical, but he can see the switch on the mountain about 10 miles away.

You need about 2 microvolts into the modem to get a low BER, less than one error in a million bits. So you can do any necessary path calculations based on that.

Gary

--

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Date: Sat, 8 Oct 1994 13:49:31 GMT  
From: gary@ke4zv.atl.ga.us (Gary Coffman)

References<9410040039.AA02497@enterprise.chinalake.navy.mil>  
<36sg1g\$11l8@hermes.acs.ryerson.ca>, <36uta3\$50k@sbrick.cs.sunysb.edu>  
Reply-To: gary@ke4zv.atl.ga.us (Gary Coffman)  
Subject: Re: 56k+ Packet System

In article <36uta3\$50k@sbrick.cs.sunysb.edu> rick@cs.sunysb.edu (Rick Spanbauer) writes:

>Donald Jeff Dionne (jeff@riddler.ee.ryerson.ca) wrote:  
>: Erich Muschinske (erich@enterprise.CHinalake.navy.MIL) wrote:  
>: : >Sorry to rain on your parade, but others have been down the path  
>: : >you want to take before you, and it doesn't work. Adapting high  
>: : >speed telephone modem techniques to multipoint to multipoint radio  
>: : >systems is a lost cause. The problems of packet radio are \*different\*  
>: : >from those of the telephone network, and require different solutions.  
>: Not really. Multipath and such are impediments to any modulation scheme that  
>: relies on phase information, such as QAM but it can still be workable.  
>

> I wouldn't be too quick to dismiss QAM out of hand. The HDTV and  
> catv folks are looking hard at VSB, QAM for both wired and broadcast  
> systems. These system rely on adaptive equalizers to deal with  
> reflections, though we'll need a fairly long one in over the air apps..  
> Any of these systems promise >> 10 mbps. To the best of my knowledge,  
> both are still untested in broadcast applications, however.

QAM is fine, but not over typical voice grade amateur radios. The GRAPES RF modem uses MSK, but it would generate QAM by a relatively simple EPROM change. The detector would have to be redesigned however. That's certainly doable, and may be an upgrade path for the modem. What the RF modem offers that voice grade radios don't offer, however, is a consistent RF section with known phase, frequency, and amplitude responses. You'll never get that from a random collection of amateur voice grade radios, and DSP can't compensate for \*all\* of them on the same channel at the same time. There's no way to \*train\* to multiple signals from multiple \*different\* kinds of radios coming along multiple paths in a random packet by packet sequence.

>: I think what needs to happen is for us to adopt a standard for high speed  
>: packet over standard bandwidth channels. With \*very\* little effort, 19.2 is  
>: more than possible, and probabily 38.4 without too much trouble at all. Of  
>: course multipath and fading will kill it :-) who cares? for local stuff,  
>: I'll live with that, and the high speed backbone links can stay ugly low  
>: tech FSK (that went out with the 1970, IMHO).

>  
> At this point in time, we should aim much, much higher than  
> 19200. I've read at least a couple of papers over the past year  
> describing 80-128 kbps modems implemented in fairly slow DSP. IMO,  
> any interesting, modern application, say talking head teleconferencing,  
> wants 100 kbit/sec or more BW delivered to the user. We should be  
> aiming for a few mbit/sec per channel, and at least 256 kbit/sec  
> delivered to the user.

We have 128 kb \*now\* with modified GRAPES RF modems, and 256 kb is within conception without major modifications. Switching to multi-level QAM could double or triple even that, though paths would require higher SNR to give acceptable BER. Of course these are all \*raw\* rates, use of compression will allow even higher effective throughputs with any of these systems. To go above 1 Mbit/s raw will require rather fundamental redesign of equipment. But crude FSK equipment with that throughput is now available in the microwave range.

>: Another thing we need to realize is that \$600 is just plain silly, and far  
>: out of reach of the end user. It's got to be \$150 and use you hand held.

This is the fundamental fallacy of amateur packet. Anyone seriously doing packet will dedicate a radio to that use. Take the typical FT-530 at around

\$500 and the typical 9600 TNC such as the Kantronics 9612 at \$220, and you've \*already\* spent more than needed for a 56 kb system, and your system is much less capable and reliable than the 56 kb unit.

>: All very do-able, but there are lots of issues to consider for the hardware.

It's \*not\* doable at amateur volumes. The market is too small to allow hitting a \$150 price point with a DSP modem. And even if you could retail it for \$300, you still have all the limitations of varying models of voice radios I've outlined in other messages.

> Perhaps the most important aspect of developing new modems is to have  
> the stuff available off the shelf. In these days of surface mounted  
> components, it is simply impractical to have people stuff a board  
> with fine pitch 208 pin PQFP's using their Radio Shack 40 watt iron....

That's right, they have to spend \$50 for a static hot air torch like the Weller PyroPen. Works fine for SMD assembly. SMD is definitely the wave of the future for all homebrew construction. Amateurs are going to have to get used to it. (The existing GRAPES modem doesn't use SMD however, though future versions might.)

Gary

--

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Date: Sat, 8 Oct 1994 13:11:16 GMT  
From: gary@ke4zv.atl.ga.us (Gary Coffman)

References<9410040039.AA02497@enterprise.chinalake.navy.mil>  
<36u4fd\$56h@push.stack.serpukhov.su>, <Cx9FrL.IxF@world.std.com>  
Reply-To: gary@ke4zv.atl.ga.us (Gary Coffman)  
Subject: Re: 56k+ Packet System

In article <Cx9FrL.IxF@world.std.com> dts@world.std.com (Daniel T Senie) writes:  
>In article <36u4fd\$56h@push.stack.serpukhov.su>,  
>Victor Voronkov <victor@stack.serpukhov.su> wrote:  
>>Erich Muschinske (erich@enterprise.CHinalake.navy.MIL) wrote:  
>>> Don't be too fast to dismiss this idea. One of the things packet networking  
>>> desperately needs is a cheap high speed data link. This is necessary for  
>>> operating a cellular packet concept. It would only have to work with the  
>>> radio on the other end, so adapting would not be out of the question. If

>>> the price of a link could come down to about \$600, I would be very interested.  
>>IMHO any attempt to get speed more than 9600 on HandHeld or other 'voice'  
>>Radio is problem. Even if we find new modulation. With half-duplex  
>  
>Can I ask a question here? How is it possible to get the necessary S/N ratio  
>and other such to get a V.32bis modem to operate correctly over a Cell Phone?  
>It seems to me that it IS possible for cell phones to provide a clean enough  
>signal to do data over them, so why do hams have so much trouble getting  
>the needed S/N ratio to run at 9600? I must really be dense and missing  
>something. I understand that the example of V.32bis (14.4kbps) over cellphone  
>is point-to-point. So are most amateur 56K links. Why can't we do a high  
>speed link over inexpensive gear and limited bandwidth? It seems to work  
>for cell...

You *are* missing something Dan. It's not SNR that's the problem. While it's true that most ham HTs are sorely lacking in adequate SNR over many paths for *any* type of modulation, including voice, hence the term handi-scratchie, that's *not* the main problem. Cellular phones are like the rest of the telephone system in that the phone network handles the addressing and routing *out of band*. This means that when the phone rings, the modem *knows* the signal is for it, and can initiate a *training* sequence with the modem on the other end to equalize and utilize the one transmission path then in use. It is an *exclusive* circuit with no other modem signals present.

The only difference that a cellular modem faces versus wireline modems is occasional signal dropouts due to handoffs, and the usual multipath concerns. Therefore special modem parameters have to be used such as slow disconnect so that the modem won't drop the connection during a brief handoff outage, and robust error detection to handle the multipath induced symbol errors. We already have all that in packet.

What we *don't* have on packet is out of band routing and addressing, and what we *don't* have on packet is *exclusive* use of a frequency for a pair of stations. A packet modem has to successfully decode the header of *every* packet on the channel to assure that the packet either is or is not addressed to it. It *cannot* initiate a training sequence every time it hears a packet it can't decode. *That's* why packet modems can't use training, and training is the key to high speed data over a voice grade circuit. Every telco modem over 2400 baud uses some form of training at call setup. In packet, setup must be on a packet by packet basis, and that won't work because not all packets on the channel are addressed to the same modem.

With the typical Kenmore, Yahoo, Icky, and Motrash radios used by amateurs, no two of them will have the same bandpass characteristics. Training is *essential* to compensate for that, and for off channel stations. Amateur equipment doesn't have the frequency stability of

commercial equipment, so it isn't unusual to have one or more radios a kilohertz or more off channel. Nor is it unusual to see wide differences in deviation from one radio to the next, even among those of the same make and model. Any modulation used has to be tolerant of all those errors \*without\* compensation on a packet by packet basis. That's why systems as slow as 9600 baud are difficult to setup with more than two stations. 2400 baud is about as fast as an uncompensated system can work with multiple players.

The limitation is \*not\* with the modems, it's with the \*radios\*. To successfully use high speed packet, we \*must\* have radios with identical response characteristics, and that means dedicated data radios, all optimized for the \*same\* response. Now it may be possible to compensate \*all\* radios the same way in a system by use of DSP, but it's not likely. There are too many variables outside the control of the DSP, such as whether the radio is on channel center or not, and the differing multipath from one radio path to the next. We need identical radios, \*and\* a modulation that is tolerant of certain types of errors. Such systems exist, I keep pointing to the GRAPES 56kb RF modem as an example, but insistence on using voice grade amateur equipment for high speed packet is futile. Amateur packet networks are \*not\* like the telco network, and telco techniques won't work.

Gary

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End of Ham-Digital Digest V94 #335

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